I.

THE PRESIDENT'S ADDRESS.

By GEORGE M. STERNBERG, M. D.,

Major and Surgeon U. S. Army.

I am sure that all the older members of the American Public Health Association feel, as I do, that our meeting this year has a special interest, due to the locality in which we meet. We feel that the good city of Memphis is, in a manner, a protegé of our Association, because in her hour of distress she appealed to some of our most distinguished members for sanitary counsel, and acted upon the advice given; and we recognize the fact that in more than one way our relations to this city are exceptional.

It was due to the yellow fever epidemic of 1878, in which Memphis was the chief sufferer, that steps were taken at our meeting of that year, in the city of Richmond, to urge upon congress the importance of a National Board of Health. Recognizing the fact that epidemics do not respect state boundary lines, and that an efficient sanitary service in times of emergency requires a liberal expenditure of money and unity of action on the part of sanitary officials, we urged the formation of a central health board, and for a time it seemed as if our well meant plans would be crowned with success. Indeed, they were crowned with partial success, for all must recognize that in the early days of its existence the National Board of Health accomplished much good. It is unnecessary for me to refer to the various circumstances which conspired to paralyze the effective energy of this board. Unhappily it is a thing of the past, and the hopes which we had founded upon this our bantling are but a memory of the past. But we should not be discouraged that our first effort has failed. A careful consideration of the circumstances which led to this failure may enable us to mature a better plan. Such a plan, endorsed by the judgment of the experienced sanitarians here assembled, and properly presented to our national legislators, could not fail to receive respectful attention.

One thing appears to me to be clearly demonstrated by the experience of the past, namely, that a central health board, to be efficient, must be attached to one of the departments of the government now in existence, so that it may be under the protection of a cabinet officer. It would be useless to ask at the present time that the sanitary interests of the country may be represented by an additional cabinet officer, a minister of public health, although there can be no doubt that the interests involved

are sufficiently important to justify such an innovation. But we may at least demand that the sanitary interests of the people of the United States shall receive the same consideration from the national government that is accorded to the educational interests, the agricultural interests, etc. We may at least ask for a bureau of public health, with a commissioner at its head, and with the necessary secretaries and clerical force to make it efficient; and attached to such a bureau should be a well equipped laboratory, in which expert bacteriologists, chemists, and sanitary engineers should be employed in the experimental investigation of unsettled sanitary problems, such as the natural history of disease germs, the best methods of destroying them, protective inoculations against infectious diseases, problems in sanitary engineering such as the disposal of sewage, domestic sanitation, etc., food adulterations, and a variety of other questions of equal importance which will readily occur to you. I do not approve of the plan of having a central board of health composed of members located in various parts of the country. Such an organization is cumbersome; and it cannot be expected that a board which is only assembled at long intervals, and of which the members are occupied by various pursuits which claim their time and best thought, will render the most efficient service. On the other hand, by diversity of opinions they may greatly embarrass their executive officer, who must necessarily be located in Washington. Nor in my opinion would a board composed of officials at the head of various departments in Washington, such as the surgeons-general of the army, the navy, and the marine hospital service, as has been suggested, be much better. These officials are fully occupied with the duties pertaining to their office, or at least have not sufficient leisure to undertake the executive work of a central health bureau. I would therefore expect better results from the untrammelled action of a single commissioner, who would be responsible directly to the cabinet officer to whose department his bureau was attached, and who would necessarily be controlled by the law defining the nature of his duties. In this case it is evident that the good accomplished would depend largely upon the fitness of the man selected for the special duties entrusted to him, and that a political appointment in the first instance, or the removal of a suitable man for party reasons, would entirely defeat our object.

We may, however, ignore this possibility, and trust to the good judgment of the chief executive, and the growing public sentiment in favor of retaining efficient bureau officers without respect to party changes.

In connection with a bureau of public health, it would certainly be desirable to have an advisory board of health, to which the commissioner could refer questions for consideration, or which could advise him of new measures, or desirable changes in his regulations, which after full discussion commended themselves to the judgment of the board. Such a board should have no executive power, and the members should receive no pay, beyond their actual expenses in attending the appointed meetings. I would suggest that such a board should consist of the surgeons-general of the army, the navy, and the marine hospital service, and

of the presidents of state boards of health. One annual meeting in Washington would probably answer the purpose for which a board would be constituted, except in case of an actual or threatened epidemic, when it might be convened at the suggestion of its president or of the commissioner of health.

I request your careful consideration of the plan here suggested, and, if it meets your approval, would urge the importance of taking such action at the present meeting as will insure its being properly brought before the congress of the United States.

My reference, at the outset of my address, to the Richmond meeting of this Association will recall to those of you who were fortunate enough to be present at that meeting the very great interest which attached to the reading of reports upon the epidemic of that year, and especially will you recall the scene when our lamented colleague, Dr. Samuel M. Bemiss, of New Orleans, occupied the platform. Surrounded by diagrams showing the topographical features of the towns in the great Mississippi valley, which had suffered most from the epidemic, and with tabular statements of population, mortality, etc., Dr. Bemiss, with the clearness and precision which characterized his delivery, passed in review the terrible record of the devastating pestilence. His genial and rugged face, aglow with humanitarian zeal and an intelligent appreciation of the sanitary lessons conveyed by the stern facts which he presented to us, made an impression upon my mind which will not soon be effaced. Alas! that he is not here with us to congratulate the good citizens of Memphis upon the favorable change which has occurred in their sanitary surroundings since the date of which we are speaking.

Sanitarians recognize the fact that epidemics are often blessings in disguise, just as great fires may be in badly built cities. Certainly not a blessing for those who suffer directly from the scourge ;—but the traveller who sees broad and well paved streets, substantial and well ventilated dwellings, and a healthy looking population, where formerly narrow, filthy streets and crowded tenement-houses occupied the ground, may be excused for looking upon the conflagration which cleared the way for such improvements as a blessing. So, too, sanitarians, recognizing the fact that in many instances nothing short of an epidemic will arouse the people to take action with reference to sanitary improvements, cannot fail to see that the benefits which result from an epidemic of cholera or of yellow fever, in the long run, may more than compensate for the distress and loss of life which attend them. A cholera epidemic which decimates the population of a town without sewers or proper water-supply will prove a blessing in the end if it leads to the introduction of an ample supply of pure water and of a system of sewerage by which the mortality from typhoid fever and other endemic diseases is greatly reduced. But this mode of obtaining sanitary improvements is an expensive one, and rather hard on the victims of the epidemic.

The members of this Association, therefore, actuated by a humanitarian spirit, desire to secure these benefits for every town in this broad land, if

possible in advance of the scourge which is sure to come some day if their warnings and the lessons of past experience do not suffice to arouse the inhabitants of insanitary towns to a sense of the risks they run. It is a remarkable fact, that in matters of this kind individuals and corporations are slow to profit by the experience of others, and that it is commonly only when the fatal results of neglect are brought under their immediate observation that they are ready to apply the remedy, which is necessarily more or less expensive. We all remember how promptly the people of Memphis responded when the epidemic stimulus was applied, and we have heard much of the sanitary improvements which have been made in this city since the memorable year 1878. Many of us are here for the first time; and, as I have said, this meeting possesses special interest for us because it enables us to see for ourselves what has been done and what remains to be done in order to put Memphis in a state of defence in the event of another yellow fever epidemic in the Mississippi valley.

Do not allow yourselves to fall into a state of inaction and false security because for several years our foe has been kept at bay. Although it is now evident that yellow fever is not endemic in any portion of our land, and we have learned by recent experience that by proper measures it is possible to exclude it for a series of years even from the city of New Orleans, yet there are so many possibilities of its introduction, in spite of the vigilance of those who have charge of the gateway of the Mississippi valley, that it would be folly to neglect those local measures of sanitation which remove the vulnerability of cities in the presence of the germs of pestilential diseases. Shutting the door is of prime importance, and while the keys are in the hands of our energetic and able colleague, Dr. Holt, we may feel comparatively safe. But the efficient president of the Louisiana State Board of Health cannot guarantee that all avenues of approach are securely guarded, inasmuch as some of these avenues are quite beyond his control. This is exemplified by the Biloxi epidemic of 1886. Local outbreaks, such as that at Biloxi, and the epidemic at Key West and at Tampa during the present year, show that the conditions upon our gulf coast are no less favorable to the prevalence of yellow fever than they were in former years, and that our immunity depends solely upon the exclusion of an exotic germ. Unfortunately, also, the Biloxi epidemic illustrates the very great liability of physicians to fall into error with reference to the diagnosis when yellow fever unexpectedly makes its appearance at a place outside of its habitual range. History repeats itself in this particular. The early cases in an epidemic, which are often mild, are pronounced to be malarial fever, and this diagnosis is often sustained by those who have committed themselves to it, when no reasonable doubt remains in the minds of unprejudiced physicians as to the nature of the malady.

The question whether it is practicable to make a city, which lies within the area subject to invasion, proof against epidemics of yellow fever and cholera, is one of very great importance. At the International Sanitary Conference of Rome the delegates from England and from India opposed

all quarantine restrictions as unnecessary, and pointed to the fact that for years there has been constant and free communication between cholera-infected ports in India and the seaport cities of England, but that cholera has not effected a lodgment in that country. Dr. Thorn Thorn, of the Local Government Board, a delegate to the Conference, ascribed this immunity to the sanitary improvements which have been carried out in England during the past ten or twelve years. He stated that during the period included between the years 1875 and 1884, an amount exceeding six and one quarter millions sterling per annum had been expended in England "under private and public acts mainly of a sanitary character." Dr. Thorn Thorn, in his report of the proceedings of the Conference referred to, says,—

"Lastly, I would note that I took occasion to explain to the technical commission that expenditures such as I have referred to are, with only very trivial exceptions, voluntarily incurred in the interests of public health.

"I then went on to show, in connection with this expenditure, that the average annual mortality for England and Wales was now only 19 as opposed to 22 per thousand in the decennial period 1861–'70, and this notwithstanding increase in population of some five millions; and taking the continued fever mortality of this country as that which, in point of causation, most nearly resembled cholera, I pointed out that whereas in the five years 1865–'69 this mortality was at the rate of 934 per million living, it has steadily fallen to 428 per million during the period 1880–'82, and that it was now only 307 per million."

In a later communication, published in the "Practitioner" for October, 1887, Dr. Thorn Thorn gives fuller details of the English system of protection against cholera as follows: "Having deliberately abandoned the system of quarantine, we began many years ago to organize the system of medical inspection with isolation. The medical inspection comes first into operation on our coasts. The customs officers board the vessel coming into our ports, and they at once communicate to the sanitary authority the occurrence of any case of cholera, choleraic diarrhœa, or suspected cholera. A vessel so affected is detained until the medical officer of health has examined every member of the crew and passengers. Those actually sick of cholera or choleraic diarrhœa are at once removed to the port sanitary hospital, and any person certified to be suffering from any illness which that officer suspects may prove to be the cholera is detained for a true period of observation not exceeding two days. The medical inspection is thus followed by isolation of the sick. Unlike a quarantine system, this process does not interfere with the healthy, or expose them to risk by herding them together with the sick, but the names of the healthy and the places of their destination are taken down, and the medical officers of health of the districts in question are informed of the impending arrivals. This part of our system has been named our first line of defence, but it would be of little value if we stopped there. Our main trust is in the promotion of such local sanitary

administration in every part of the country as shall rid us of the conditions under which alone cholera can spread. In periods of emergency, as during the past three years, a special medical survey of such districts as are most exposed to risk is organized under the supervision of the medical officer of the local government board, and where needed the sanitary authorities are urged to action. Important as have been the results of the recent survey, they would go for little were it not for the steadily maintained work of sanitary authorities and their officers throughout the kingdom; and we who have been taunted abroad for opposing quarantine because its restrictions touched our commercial interests and our pockets, may justly feel proud that in England and Wales alone, the people have, during the last ten years, of their own accord and apart from government dictation, spent by way of loan or in current expenditure over eighty millions sterling, for purposes mainly of a sanitary character. And we may fairly ask whether any corresponding expenditure has in other countries given evidence of real faith in a quarantine system."

Without denying the value of the sanitary improvements which have been carried out in England, and the possibility that her immunity from cholera is largely due to them, the delegates from more exposed countries, such as France and Italy, demanded a quarantine station upon the Suez canal, and pointed out the fact that their seaport cities were not in such a sanitary condition that they could hope to escape the ravages of the pestilence in case of its introduction, and that to place them in such a state of defence would require time and the expenditure of large sums of money. It was noticeable that those countries, such as Turkey, Egypt, and Spain, where sanitary improvements have made the least progress, were the most exacting with reference to quarantine restrictions. They evidently looked upon these as their only hope, and were advocates of the old-fashioned time quarantine, which as carried out in these countries has often been attended with barbarities which are intolerable for civilized nations. Self-preservation is indeed the first law of nature, but it is barbarous to sacrifice the life of another to save our own; and in guarding the lives of a community we are bound to show due consideration for the health and comfort of those who are believed to be the possible bearers of disease germs.

Recognizing this humane principle, a majority of the delegates to the Sanitary Conference of Rome were anxious to effect a compromise between the old-fashioned time quarantine and the English practice, which they could not rely upon for the countries of southern Europe. It was believed that such a compromise was practicable, and that the plan agreed to by a majority of the delegates present was more reliable than a simple quarantine of detention. I must refer you to the published transactions for the details of this plan, but, in brief, it consisted in a sanitary supervision of ships at the port of departure, when this was an infected port, or in communication with an infected locality; in the sanitary supervision of ship and passengers while *in transit*, by a properly

qualified physician upon all passenger ships; and in such detention at the port of arrival as might be necessary for the disinfection of the ship, the personal effects of passengers, etc. If one or more cases of cholera should appear on board during the voyage, they were to be isolated, and rigid measures of disinfection carried out, and the action of the health authorities at the port of arrival was to depend largely upon how effectively this had been done. In short, the treatment of the vessel and its passengers was not to be determined in advance by arbitrary rules, but was to be governed by an intelligent consideration, by an expert, of all the circumstances relating to the sanitary history of the ship from the date of its departure from the infected port. This rational quarantine service, which is far less burdensome to the commerce of a country than the arbitrary time quarantine of former days, has proved itself to be also more effectual in accomplishing the end in view. This is amply proved by recent experience in our own country, where to a large extent the principles indicated control the action of the health officers of our principal seaports. Look at the city of New Orleans, where epidemics of yellow fever were formerly so frequent as to lead to the belief that the disease was endemic, and a necessary evil appertaining to the situation of the Crescent City. Happily, under an efficient quarantine service, she has now a record of seven years' exemption from the dreaded pestilence.

It is perhaps too soon to speak with confidence with reference to the action taken by the sanitary officials of the port of New York upon the recent arrival of two cholora infected vessels from the Mediterranean, but we have good reason to hope that the measures taken will prove sufficient, and that this pestilential disease, which has for several years been threatening us from a distance, has not effected a lodgment upon our shores.

Whether it would be practicable to put our seaports in such a state of sanitary defence that it would be safe to open the door and defy the foe is extremely doubtful. I have never believed that yellow fever was excluded from New Orleans in 1862 and 1863 by the sanitary regulations enforced by General Butler, as has been claimed. The exemption from this disease enjoyed by the unacclimated soldiers from the North who filled the hospitals in that city at the time mentioned was due, in my opinion, to the absence of commerce during the military occupation of the city, and to the rigid enforcement of quarantine restrictions.

But I do believe that this and other cities similarly located can be preserved from such devastating epidemics as have too often occurred in the past, and that by the carrying out of needed sanitary improvements, and the constant supervision of expert sanitary officials, supported by an enlightened public sentiment, and sufficient appropriations, the ravages of pestilential diseases may be restricted within very narrow limits.

As regards cholera, the system of local defence is even simpler than in the case of yellow fever. Ample evidence demonstrates that the epidemic extension of this disease depends largely, if not exclusively, upon the

water-supply. Where this is subject to contamination by the discharges of the sick, there cholera is liable to become epidemic. On the other hand, cities like Rome, in Italy, which have an ample supply of pure water drawn from a source not liable to be contaminated, seem to be cholera-proof, notwithstanding the filth and squalor in which a considerable portion of the population live. The same thing is seen in Naples, which in 1884 suffered terribly, but which since the completion of its new system of water-works in 1885 has enjoyed a comparative immunity, notwithstanding the fact that cholera still prevails in Italy, and that we have evidence of its presence in a malignant form in the city referred to. When I was in Naples, in 1885, the mayor of the city invited a number of the delegates to the Sanitary Conference to the municipal palace, for the purpose of conferring with them with reference to projected sanitary improvements, and especially with reference to the best system of sewerage for the city, which up to the present time remains destitute of sewers, and which, I may add, is a noted stronghold of typhoid fever. In the course of the conversation I suggested to the mayor Col. Waring's American system, which has been tested with such favorable results in this city. My recommendation was sustained by the distinguished German bacteriologist, Dr. Robert Koch, who was one of the delegates present. I may remark that I have recently received a letter from Dr. Koch, asking me to give him full particulars with reference to the details of this system as carried out in the city of Memphis.

I am not willing to leave the subject of quarantine, to which I have briefly referred, without placing myself upon record with reference to a matter in connection with it which I consider one of the greatest importance. The practice which has come down to us from former times, when questions relating to abstract justice and individual rights had but little consideration in face of a danger to the community, of taxing commerce for the support of quarantine establishments, I consider wrong in principle, and unjust to those who are required to bear the burden. It seems to me to be evident that the people protected should pay the cost of such protection, and that quarantine establishments should be supported at the expense of the national government, or of the states in which our seaports are located, and not by a tax upon the shipping entering these ports. I am not so much concerned, however, with the unjust tax upon ship-owners as with the gross injustice to passengers, practised at many ports in various parts of the world, when they are so unfortunate as to be detained at a quarantine station. Humanity demands that a sick person who is detained for the protection of a community should receive the best possible care; and justice requires that both sick and well, while detained at a quarantine station, should be well fed and well lodged without expense to themselves. Moreover, at a quarantine establishment which is supported by a tax upon ships and upon the passengers detained, an unscrupulous official may add to the hardships of passengers the barbarity of an unnecessary detention from a venal motive. I trust that such things do not happen in our country; but to show

how unjust the principle of taxing the passenger for his support while under detention in quarantine is, I will mention a circumstance which recently fell under my own observation:

When I left Brazil in the month of August last, small-pox was epidemic both in Rio de Janeiro and at Para; our ship touched at Para, and five days later at Barbadoes. A passenger for this port was not allowed to land, because of the prevalence of small-pox in Brazil. Proceeding to St. Thomas, less than two days' sail from Barbadoes, our passenger was again refused permission to land, except to go to the quarantine station for a certain number of days. This was all right, but the conditions upon which he would be received seemed to me to be all wrong. Either he himself or the ship must guarantee the payment of the quarantine fees, which would be $3 a day for his board and $5 a day to the quarantine physician if he were alone. If others were at the station at the same time, this fee would be divided between them. One can easily imagine what a hardship such a tax would be for a person of limited means, who had only provided himself with funds for the journey he had undertaken. The agent of the ship refused to take any responsibility, and our passenger had no resource but to submit to the imposition, or to come on to New York, paying his passage to that port.

As another illustration of the evils arising from the present system of supporting quarantine establishments, I will mention a circumstance which occurred upon our arrival at the port of New York. With the deputy health officer who boarded our ship came a man with a jug. I was informed by one of the officers of the ship that he was to disinfect the vessel. Being somewhat curious to know the method of disinfection employed, I asked the ship's surgeon to go with me to inspect, when, after a detention of less than one hour, we had started from the quarantine station for our wharf. We found that the man with the jug had lowered a bucket by means of a rope through one of the hatches between decks. Upon pulling up this bucket I found that it contained two or three pounds of some powder which had been wet, probably with an acid solution, and which gave off an odor of chlorine. No doubt when first lowered between decks there had been a considerable evolution of chlorine, but in the vast space to be disinfected it was so diluted that at the end of an hour I did not detect the odor of chlorine gas when I lifted the hatch, and it was only by approaching my nose to the bucket that I was able to ascertain what disinfectant had been used. The most curious part of the story is, that I was informed that the bucket had been lowered between decks to disinfect a quantity of hides which were stored in the hold. What was the object of this "disinfection"? Evidently not to disinfect, for no one at the present day would think of maintaining that the hides in the hold had been disinfected by the procedure of the man with the jug.

The only object that I can conceive of depends upon the fact that there is a fee for disinfecting, which must be paid by the agents of the ship: at least I was so informed by one of the officers of the ship.

Gentlemen, we cannot control the action of sanitary authorities abroad, and if we are ever so unfortunate as to be thrown into a lazaretto in one of those countries where the rights of the individual are counted as nothing, God pity us! for the fact that we are American citizens will be of no avail. But we can at least correct abuses, if such exist, at our own seaports, and set an example to other nations of an enlightened policy, which will not only redound to our credit, but will directly benefit our languishing commerce.

The most enlightened nations of Europe recognize the importance of a uniform system of quarantine administration, based upon past experience and recent progress in sanitary science; and this has been one of the principal objects in view in the assembling of expert delegates from the various countries interested for international sanitary conferences.

The first International Conference was that of Paris in 1852. A second sanitary conference assembled in the same country in 1859 for the purpose of revising and simplifying the conclusions adopted in 1852. The next conference was that of Constantinople in 1866; and this, like the last conference assembled in Rome in 1885 at the call of the Italian government, followed immediately after an epidemic of cholera, and had special reference to the restriction of this disease. The conference at Vienna followed in 1874, and that of Washington in 1881. The latter following after our yellow fever epidemics of 1878 and 1879 had the special object in view of establishing an international system of notification of the appearance of epidemic disease in all parts of the civilized world, and of the sanitary condition of seaport cities, and especially of ships sailing from infected ports.

Unfortunately all attempts to establish an international code of quarantine regulations have thus far failed, owing to the very diverse opinions held by the delegates from the several nations who have been assembled for this purpose, and to the conflicting interests of some of the great powers. While as a nation we have taken part in these sanitary conferences, and have advocated an enlightened and uniform policy of quarantine administration, and international notification of infectious diseases, we have as yet no uniformity in the quarantine regulations of our own seaport cities, and no central health bureau. Gentlemen, it is well to consider these matters, and to point out to our legislators the present unsatisfactory condition of affairs with reference to the subjects referred to.

As I have already intimated, the exotic pestilential diseases to which I have referred are the levers which move corporations to make necessary sanitary improvements. But for sanitarians, aside from their effect in this way, they are of secondary importance. The number of victims which they claim is a small matter compared with the number who succumb to certain indigenous or naturalized infectious diseases which are equally subject to control by well known sanitary measures. The chief aim of the American Public Health Association should be to ascertain what measures are most effectual for the restriction of these endemic maladies, such as typhoid fever and the malarial fevers, and for the ban-

ishment of all diseases in which the contagion is given off from the persons of the sick, such as scarlet fever and small-pox. So far as diseases of the class last mentioned are concerned, we may safely say that we know how they may be banished from a community, viz., by isolation of the sick and disinfection of all infectious material, and in the case of small-pox by vaccination. Our main mission therefore is to insist upon the thorough execution of these measures.

But our mission does not cease here. We have not only to teach the American public how to guard against infectious diseases by quarantine restrictions, isolation of the sick, disinfection, and municipal sanitation, but also to teach them the principles of personal hygiene. Not only will their individual susceptibility in the presence of an epidemic depend largely upon their personal habits and mode of life, but we must show them how often organic and functional diseases of the various organs essential to life are induced by excesses in diet, improper food, the habitual use of spirituous liquors, etc., etc. I conceive that a most important part of our work in the future should consist in popularizing information of this kind. The noble examble set by our generous colleague, Mr. Lomb, of Rochester, should be followed by our Association if its finances permit, or at least we should present the subject to philanthropists, who, like Mr. Lomb, may desire to be guided by our counsel in their efforts to do good to their fellow-men. As a matter of fact, our limited means will not justify us in offering prizes for essays on sanitary subjects, and the most that we can afford is to print and distribute at cost such essays as may seem suitable for popular distribution.

In another direction, however, we may accomplish much good with comparatively small amounts of money whenever our treasury will admit of it. I refer to special investigations in sanitary science, committed to expert investigators who are willing to devote their time to the work, and who would ask only for such sums as might be necessary to cover the actual expenditures for apparatus, material, etc.

The exact knowledge which has been obtained during the last decade with reference to the etiology of the infectious diseases has been promptly applied in a practical way by sanitarians, and every addition to our knowledge in this direction is of the greatest importance to sanitary science, which, so far as we can see, will reap far more benefit from a precise knowledge with reference to the essential characters of each specific disease germ than can be hoped for by the clinician.

It is not creditable to us as a nation that so small a share of the progress in this direction is due to American investigators. In the absence of any department of the national government having the power and disposition to support investigations in this field of science, the few who have pursued bacteriological studies in this country have worked under disadvantages which were not only discouraging, but absolutely incompatible with the most efficient work and fruitful results. But the future is more hopeful. Individual munificence, in several of our large cities, has supplied the means which should have been provided long since by

the national government, for pursuing investigations in bacteriology and in experimental pathology.

In Baltimore we have a well equipped bacteriological laboratory, under the direction of the able professor of pathology of the Johns Hopkins University. In New York, Boston, Philadelphia, and, I believe, in several other cities, bacteriological laboratories have been established in connection with well known medical schools.

In Brooklyn, the Hoagland laboratory, now in process of construction, under the immediate supervision of the gentleman who provides the funds required for the building and its equipment, will supply all of the facilities, both for students and for advanced investigators, which can be found in the best equipped laboratories of Europe. I am informed, also, that our colleagues from the state of Michigan, who are always in the front rank in urging upon their legislature measures which will advance the sanitary interests of the state, have secured the establishment of a bacteriological laboratory in that state. We have to thank one of our colleagues from the state mentioned for a most important discovery in the field of sanitary science. I refer to the discovery of tyrotoxicon by Professor Vaughan. With a well equipped laboratory under his direction, there is good reason to believe that this discovery, so creditable to American science, will not stand alone to the credit of the good state of Michigan.

Our Association has already taken the initiative in encouraging and assisting, from its slender treasury, investigations in sanitary science. The Committee on Disinfectants, appointed at the St. Louis meeting in 1884, has made an extended experimental research with reference to the value of various agents for the destruction of disease germs. The final report of this committee will be submitted at the present meeting. I say final, because in my judgment all the necessary data are now at hand for determining the agents most useful for disinfecting purposes under various circumstances, and I think the conclusions of the committee may be accepted as a safe guide for future practice. It is true that more work can be done to advantage in this direction, and it will be desirable to test from time to time new agents which may be suggested for disinfecting purposes; but the main object of the Association has been accomplished, and we now know what agents can be relied upon for the destruction of disease germs of various kinds, and in what proportion these agents must be used to be efficient.

In consideration of the limited means at our disposal for encouraging the scientific investigation of sanitary problems, I would suggest that the Association raise a special fund for this purpose, by calling for contributions from its members, and from others who may be willing to aid us in our efforts in this direction. If you approve of this suggestion, I trust that some member will introduce the necessary resolutions.

One of the subjects which might be taken up by a committee appointed for the purpose and aided from the special fund would be a biological investigation of the water-supply of towns and cities in the United States.

Evidently such an investigation would be a protracted one, and it would be advisable to begin with those towns which have a notoriously bad water-supply. Perhaps it could be arranged that a portion of the expense, at least, would be paid by the town or city whose water-supply was examined, as the inhabitants of such town or city would be especially interested in the result of the investigation.

Another question of the greatest interest to us is that which relates to the possibility of protecting individuals from fatal infectious diseases by inoculations with an attenuated virus.

Protection from small-pox is no longer a solitary instance of prophylaxis by inoculation. In anthrax, in swine-plague—*rouget*—and in pleuro-pneumonia, protective inoculations have been practised upon a large scale, and the value of the method is fully demonstrated. The evidence in favor of Pasteur's inoculations for the prevention of hydrophobia is such that we can scarcely doubt that it has a relative value, notwithstanding the considerable number of deaths that have occurred among those who have been inoculated. The recent report of the English commission, made after a thorough investigation, is favorable to the method, which may perhaps hereafter be modified so as to give still better results.

In the various infectious diseases of the lower animals, which have been studied during recent years, including those forms of septicæmia which are only known to us by laboratory experiments, we have much evidence that protective inoculations with an attenuated virus may be successfully practised. And there is good reason to hope that in all diseases in which a single attack protects from future attacks, protective inoculations may be practised when once we have succeeded in isolating and cultivating outside of the body the specific infectious agent. We know already four methods by which the virulent potency of disease germs may be attenuated, viz., by exposure to oxygen, by exposure to heat, by exposure to the action of certain chemical agents, and by passing through the body of certain animals.

The last mentioned method is that practised by Pasteur in attenuating the virus of *rouget*. He finds that the virulence of the microbe is diminished by passing it through a series of rabbits, and that by this means an attenuated virus suitable for protective inoculations in swine may be obtained.

The possibility of attenuating a virus by exposure to the action of certain chemical agents was discovered by myself in 1881, in the course of a series of experiments upon disinfectants in which the virus used was the blood of a rabbit just dead and containing the micrococcus found in the buccal secretions of man, which I have named *M. Pasteuri*.

Among the diseases in which there is good reason to hope that a method of prophylaxis by inoculations with an attenuated virus might be successfully practised, if we could once succeed in isolating and cultivating the specific germ of the disease, is yellow fever, a disease in which, as a rule, a single attack protects.

As you know, it has been claimed both by Dr. Domingoes Freire of Brazil, and by Dr. Carmona Y. Valle of Mexico, that the yellow fever germ is discovered, and that a method of prophylaxis by inoculation has been experimentally demonstrated. As I have just returned from a special mission, the object of which was to investigate the claims of these gentlemen, you will naturally expect to hear from me at this time with reference to the results of my investigations. I regret to say that I am unable to gratify you in this natural expectation. My orders explicitly direct me "not to make publication of my investigations and of the conclusions reached by me" until I have submitted my final report to the president of the United States.

I have already occupied so much time in speaking of matters which I consider of prime importance, that I cannot attempt to make any general review of recent bacteriological researches which have a bearing upon public hygiene. As a matter of fact, all additions to our knowledge of pathogenic micro-organisms are of special importance to us as sanitarians, and it is now generally recognized that the only safe basis for practical sanitation is that which is afforded by an exact knowledge of the etiology of infectious diseases, and of the biological characters of the specific infectious agents in these diseases. Since the importance of these studies has been generally recognized, and the methods of research have been perfected, the number of trained workers has rapidly increased, and at present the greatest activity prevails in the laboratories of Europe. This is shown by the number of memoirs relating to experimental investigations made in this department of science which are constantly appearing in the journals devoted to medicine and hygiene in all parts of the world, but especially in Germany, in France, and in Italy. The Jahresbericht of Baumgarten, for the year 1886, contains abstracts of 533 papers relating to micro-organisms.

With reference to *cholera*, I may say to you that recent researches give support to the conclusions of Koch, as to the pathogenic role in this disease, of the spirillum discovered by him in the intestine of cholera patients. Its constant presence in this disease seems to be demonstrated, and it is now generally admitted by bacteriologists that there are definite characters by which it may be distinguished from similar organisms obtained from other sources, such as the Finkler-Prior spirillum, and the cheese spirillum of Deneke, which closely resemble it.

Lustig, director of the cholera hospitals at Trieste, examined the dejecta in 170 cases of cholera, and found the spirillum of Koch in every case; on the other hand the bacillus of Emmerich was only found in 40 out of the whole number of cases examined. Tizzoni and Cattani also found Koch's spirillum in the contents of the intestine in twenty-four cases examined by them during the epidemic at Bologna in 1886. At Padua, also, researches made by Canestrini and Morpurgo gave the same result: the spirillum was constantly found in the dejecta in recent cases. These observers state that the cholera spirillum retains its motility and reproductive power for a considerable time in sterilized distilled

water. They were able to obtain cultures after two months from such water. This important fact has been verified by Pfeiffer, who found, however, that in the presence of common saprophytic bacteria the cholera microbe soon died out. Hueppe has shown that the cholera spirillum forms reproductive elements, which he calls arthrospores. These are not so readily destroyed by desiccation as are the fresh baccilli, but they have nothing like the resisting power to heat and chemical agents which characterizes the endogenous spores of the bacilli. The exact proportion in which various disinfecting agents are destructive of the vitality of the cholera spirilla has now been determined with great precision, and will be stated in detail in the report of the Committee on Disinfectants for the present year. This committee has also made extended experiments of the same kind in which the typhoid bacillus, and various other pathogenic organisms, have served as the test of germicide power. The chemical products developed in cultures as a result of the vital activity of the cholera spirillum have been studied by Bitter, Buchner, and Contani. The last named author claims to have demonstrated the presence of a poisonous ptomaine in cholera cultures, which when injected into the peritonæal cavity of dogs gives rise to symptoms resembling those of cholera. A recent observation of value is that of Bujwid, who finds that *bouillon* cultures of the cholera spirillum have a peculiar chemical reaction by which they may be distinguished. According to this author, the addition of a $\frac{5}{10}$ per cent. solution of hydrochloric acid to such a culture gives rise, within a few minutes, to a rose-violet culture, which subsequently when exposed to light changes to a brownish shade. The reaction does not occur in impure cultures. The Finkler-Prior spirillum is said to give a similar reaction after a long time, but the color first developed is of a more brownish hue.

The question of the etiological role and biological characters of the typhoid bacillus discovered by Eberth in 1880, has occupied numerous bacteriologists during the past year, and very important additions have been made to our knowledge with reference to this organism. The researches of Beumer and Peiper, of Seitz, and of Frankel and Simmonds, are especially worthy of notice, but time will not permit me to give an abstract of the results reached by these and other investigators. I can only say in a general way that the earlier researches of Eberth, Koch, and Gaffky are confirmed as regards the presence of this bacillus in the intestinal glands, the spleen, and other organs in typhoid cases, and that very little doubt exists among bacteriologists as to the etiological relation of this organism to the disease in question, although no satisfactory proof by inoculations in lower animals has yet been found. This, however, is not surprising, inasmuch as we have no evidence that any of the animals experimented upon are liable to contract the disease, as man does, by drinking contaminated water.

According to Wolffhügel and Riedel the typhoid bacillus and various other pathogenic organisms tested retain their vitality for a long time when preserved in ordinary well or hydrant water, and even undergo a

considerable development in such water. Frankland, also, has found that certain pathogenic bacteria tested by him increased rapidly in numbers in the water of the Thames, and even in distilled water. Meade Bolton, on the other hand, found that micrococcus tetragonus, staphylococcus aureus, the typhoid bacillus, and the anthrax bacillus, not only did not increase in number in sterilized water, but soon perished, while certain non-pathogenic species commonly found in water increased rapidly in numbers in sterilized distilled water. A more recent research is that of Kraus, who employed well water and hydrant water from the city water-works of Munich, which, without being sterilized, was infected with pure cultures of various pathogenic organisms diluted with distilled water. The infected water was kept during the experiment at a temperature of 10½° C. Plate cultures were made from day to day. The results were as follows: The typhoid bacillus had disappeared by the 7th day, the cholera spirillum could not be found in plate cultures after the 2d day, the anthrax bacillus had disappeared at the end of four days; in the meantime the ordinary water organisms had increased enormously in number. From these experiments, considered in connection with those of Bolton and of Wolffhügel, Kraus concludes that the rapid destruction of pathogenic bacteria in non-sterilized water is a direct result of the action of ordinary water organisms. If this be true, it is evident that these water bacteria are conservative from a sanitary point of view, and that the biological test of drinking-water, which gives the number of colonies which are obtained from a given quantity, has no special value in the absence of an exact statement of the kind of bacteria and their pathogenic potency. The time has come when we must demand that those who undertake the biological examination of water with reference to its potability shall give some more definite information than that a certain number of colonies were found, some of which liquefied gelatine and some did not. Up to the present time we have but few instances of the finding of known pathogenic bacteria in water used for drinking purposes. Koch found his spirillum in a water-tank in India, and several observers have reported the finding of the typhoid bacillus in drinking-water. Recently Beumer examined the water of four wells in a vicinity where cases of typhoid fever had repeatedly occurred. From one of these wells colonies were obtained by the plate method, which proved to have all of the characters of the typhoid bacillus. The distinguished German chemist Brieger has succeeded in obtaining a toxic ptomaine from cultures of the typhoid bacillus, which has the composition of $C_7 H_{17} NO_2$.

The question of the etiology of croupous pneumonia has received much attention during the past year, and it is now evident that the bacillus of Friedlander, which has been cultivated for some years in the laboratories of Europe under the name of "Pneumococcus," is not entitled to this distinctive appellation. On the other hand, evidence is accumulating that a micrococcus which I have described under the name of *M. Pasteuri*, and which is found in normal human saliva, is far more frequently found in the exudate into the alveoli during the acute stage of croupous

pneumonia than is that of Friedlander. I first experimented with this micrococcus in 1880, and isolated it in pure cultures in 1881, but it was not until January, 1885, that I discovered its presence in pneumonic sputum, and made inoculations in rabbits with this material.

The record of my first successful experiment, published in the *American Journal of the Medical Sciences*, for October, 1885, is as follows: "Jan. 2, 1885. Inoculated two rabbits subcutaneously with pneumonic sputum, collected with great care by my friend, Dr. Rohé, and brought to me at once, from a white male patient, aged nineteen, in the seventh day of illness, second day of bloody expectoration. Both rabbits were found dead on the morning of January 4th. In both, the pathological appearances were identical with those constantly observed by me in rabbits killed by the subcutaneous injection of my own saliva, viz., extensive inflammatory œdema extending from point of injection, enlarged spleen, and presence of oval micrococci in blood and in effused serum in the subcutaneous connective tissue." In the same paper I say,—

"It seems extremely probable that this micrococcus is concerned in the etiology of croupous pneumonia, and that the infectious nature of this disease is due to its presence in the fibrinous exudate into the pulmonary alveoli. But this cannot be considered as definitely established by the experiments which have thus far been made upon lower animals. The constant presence of this micrococcus in the buccal secretions of healthy persons indicates that some other factor is required for the development of an attack of pneumonia, and it seems probable that this other factor acts by reducing the vital resisting power of the pulmonary tissues, and thus making them vulnerable to the attacks of the microbe. This supposition enables us to account for the development of the numerous cases of pneumonia which cannot be traced to infection from without. The germ being always present, auto-infection is liable to occur when from alcoholism, sewer-gas poisoning, crowd poisoning, or any other depressing agency, the vitality of the tissues is reduced below the resisting point. We may suppose also that a reflex vaso-motor paralysis, affecting a single lobe of the lung, for example, and induced by exposure to cold, may so reduce the resisting power of the pulmonary tissues as to permit this micrococcus to produce its characteristic effects.

"Again, we may suppose that a person, whose vital resisting power is reduced by any of the causes mentioned, may be attacked by pneumonia from external infection with material containing a pathogenic variety of this micrococcus having a potency, permanent or acquired, greater than that possessed by the same organism in normal buccal secretions."

The extended researches of Frankel and of Weichselbaum show that this micrococcus is very commonly if not constantly present in the exudate of croupous pneumonia, and both of these investigators are inclined to attribute to it a specific pathogenic role in connection with the malady in question. Frankel's first paper was published in 1886. In this paper he says,—

"Finally, as regards the relative frequency of the two hitherto investi-

gated microbes, in cases of pneumonia, no positive statement can yet be made. Nevertheless, I am inclined to regard the lancet-shaped pneumonia-coccus, which is identical with the microbe of sputum-septicæmia, as the more frequent and the usual infectious agent of pneumonia, on the ground that this organism is so much more frequently found in the sputum of pneumonic patients than in that of healthy individuals. This conclusion is further supported by the circumstance that it has not hitherto been possible to isolate directly from the rusty sputum Friedlander's bacillus."

Weichselbaum reports that he has found this organism in ninety-four cases of pneumonia, eighty of which were primary, and fourteen secondary. On the contrary, he only found Friedlander's bacillus in nine cases; in three of these cases it was associated with the diplococcus above referred to, and in only three instances was it obtained alone in pure cultures.

Weichselbaum arrives at the conclusion that pneumonia may be induced by several different organisms, but that the diplococcus which I have called *M. Pasteuri*—a name, by the way, which none of the German authors have been willing to accept—is by far the most frequent cause of genuine croupous pneumonia.

Whatever may be the final conclusion with reference to the specific etiological *rôle* of this or other micro-organisms in pneumonia, we must recognize the importance of secondary causes which control the endemic and epidemic prevalence of the disease; and these have recently been worked out in a very satisfactory manner by a distinguished member of our Association, Dr. Baker, of Michigan.

Among the most important investigations of the past year are those of Councilman of Baltimore and Osler of Philadelphia, with reference to the presence of micro-organisms in the blood of malarial fever patients. Both of these observers confirm the discovery of Laveran, who in 1880 announced, as the result of extended researches made in Algeria, that blood drawn from the finger of such patients during a febrile paroxysm contains a parasitic infusorium, which presents itself in different phases of development, and which in a certain proportion of the cases was observed as an actively motile flagellate organism. Osler and Councilman have found all of the forms described by Laveran; and the last named observer reports that in recent researches, in which blood was obtained directly from the spleen, the flagellate form was almost constantly found. Whether the amœboid "plasmodium" found by Marchiafava and Celli of Rome represents an early stage in the development of this organism, or whether it simply represents a change in the red blood corpuscles, which occurs also in other diseases, as is claimed by Mosso, has not yet been definitely determined. It is somewhat curious that just when we are receiving satisfactory evidence of the presence of the parasite of Laveran in the blood of malarial fever patients, the bacillus of Klebs and Tomassi-Crudelli, which appeared to be dead and buried, has again been introduced to our notice by the distinguished

German botanist, Ferdinand Cohn. In his paper, published in June last, he gives an account of the researches of a young physician named Schiavuzzi, who has made researches in the vicinity of Pola, a malarial region in Istria. The method followed was that of Klebs and Tomassi-Crudelli, viz., examination of the air and water in malarial localities, and inoculation experiments in rabbits.

The bacillus was constantly found in the air, and the rabbits inoculated presented symptoms and pathological lesions believed to be identical with those of malarial fever in man. I cannot at the present time go into a critical discussion of the evidence presented, but would refer you to an experimental research made by myself in New Orleans in the summer of 1880, in which I repeated the experiments of Klebs and Tomassi-Crudelli, and arrived at the following general conclusions:

"Among the organisms found upon the surface of swamp-mud near New Orleans, and in the gutters within the city limits, are some which closely resemble, and perhaps are identical with, the bacillus malariæ of Klebs and Tomassi-Crudelli; but there is no satisfactory evidence that these, or any of the other bacterial organisms found in such situations, when injected beneath the skin of a rabbit, give rise to a malarial fever corresponding with the ordinary paludal fevers to which man is subject."

I see no reason to modify the opinion here expressed, notwithstanding the endorsement given by Cohn to the results announced by Schiavuzzi. These researches relating to organisms in the air and water, and experiments upon rabbits, especially in the hands of an inexperienced investigator, cannot have any great scientific value in the elucidation of an etiological problem. The sources of possible error are too numerous, and the method is in any case inadequate for the complete solution of the problem. It is essential that the infectious agent, especially one so easily demonstrated as this bacillus, be proved to be present in the blood or tissues of malarial fever patients; and in the absence of such proof, experiments upon rabbits and researches in the air of malarial regions can have but little weight. It may well be that in the swampy districts of warm climates, where malarial fevers prevail, one or more species of bacillus will be found in the air or in the water, which are absent from the drier air and running waters of non-malarious uplands; but this is simply an interesting fact in natural history, relating to the distribution of organisms of this class, and by itself cannot be accorded any value in a consideration of the important question of etiology. The method of research pursued by Laveran, by Marchiafava and by Celli, by Councilman and by Osler, is the true one, and none of these gentlemen have encountered the bacillus of Klebs and Tomassi-Crudelli in their extended researches. On the other hand, they are in accord as to the presence in the blood of a peculiar flagellate organism, and of certain spherical and crescentic bodies which are believed to represent different stages in the life history of this infusorium.

If time permitted I would be glad to continue this review of the recent progress made in the interesting field in which I have been for some

time an enthusiastic worker, but your patience would be exhausted long before I could reach the end of the story.

The importance attached by the profession to studies of the nature of those referred to, is well stated in a recent editorial in the London "Lancet," relating to the International Hygienic Congress recently assembled at Vienna. The editor says,—"The Vienna meeting will serve the double purpose of indicating the necessity of skilled investigation of the causes of disease, and of encouraging statesmen to rely upon work of this character rather than upon collective opinion. The excellent work which is carried on in the continental laboratories has undoubtedly had its effect in teaching the value of exact knowledge, but there was none the less too great a desire at Vienna to record by resolution the opinion of members, regardless of their fitness to exercise any proper judgment upon the points at issue."

Before concluding my address, it becomes my sad duty to remind you of the losses which our brotherhood of sanitarians has sustained during the past year; to speak of those whose voices will no more be heard among us, who have joined the great army of the dead. Happily for us they have left a record behind them of honest endeavor and earnest words spoken in behalf of their fellow-men. Their names are not simply recorded in the list of our members, but also in our hearts, and a permanent record of their contributions to sanitary science will be found in the papers to which their names are attached, which are contained in the volumes of our Transactions.

Unhappily the list contains the names of several of our most highly esteemed members. As the Committee on Necrology will make a report for publication in our annual volume, in which the important facts relating to the lives and services of these deceased members will be stated, I shall content myself at the present time with the mere mention of their names:

Hon. Erastus Brooks died at West New Brighton, Staten Island, N. Y., November 28, 1886, in the seventy-second year of his age.

Dr. Joseph Gibbons Richardson, Professor of Hygiene in the Medical Department of the University of Pennsylvania, and member of the Board of Health of Philadelphia, died of apoplexy in that city, November 13, 1886, in the fifty-first year of his age.

Dr. John P. Gray, superintendent of the New York State Lunatic Asylum at Utica, died November 29, 1886, at the asylum in that city.

Dr. Joseph C. Hutchinson, LL. D., of Brooklyn, N. Y., died of pneumonia, July 17, 1887. He was born in Old Franklin, Mo., in 1827.

Rev. John D. Beugless, chaplain in the U. S. Navy, died at his station on board a government ship, the Brooklyn, while stationed at some Chinese port, in July, 1887.

Dr. Edward W. Germer, a member and ex-president of the Pennsylvania State Board of Health, and health officer of the city of Erie for fifteen years, died at his home August 21, 1887, aged fifty-four years.

Dr. Oscar Fallon Fassett, of St. Albans, Vt., died July 22, 1887.

Dr. V. H. Taliaferro, secretary of the Georgia State Board of Health in former years, aged fifty-four years.

Nicholas Jones, Esq., member of the Board of Health, Pittsburgh, Penn., died May 17, 1887, aged sixty-five years.

Dr. William Stephenson Robertson, president of the State Board of Health of Iowa, died at his home in Muscatine, Iowa, January 20, 1887, in the fifty-sixth year of his age.

Dr. George Engs, of Newport, R. I., died July 7, 1887, of heart disease, aged forty-five.

And now, Gentlemen of the American Public Health Association, having already exceeded the limits which I had intended to place upon the length of my address, nothing remains but to thank you for the kind patience with which you have listened to me, and for the high honor which you conferred upon me at Toronto, in electing me your president for the present meeting.